Operating manual

M 530P

Laboratory pH meter

ba75562e02 12/2005

Pinnacle series

Accuracy when going to press

The use of advanced technology and the high quality standard of our meters are the result of a continuous development. This may result in differences between this operating manual and your meter. Also, we cannot guarantee that there are absolutely no errors in this manual. Therefore, we are sure you will understand that we cannot accept any legal claims resulting from the data, figures or descriptions.

Warranty

We guarantee the meter described for 3 years from the date of purchase. The meter warranty covers manufacturing faults that are discovered within the warranty period.
The warranty does not cover components that are replaced during maintenance work, e. g. batteries.

The warranty claim extends to restoring the meter to readiness for use but not, however, to any further claim for damages. Improper handling or unauthorized opening of the meter invalidates any warranty claim.

To ascertain the warranty liability, return the meter and proof of purchase together with the date of purchase freight paid or prepaid.

M 530P - Contents

1 Overview 7
1.1 Keypad 8
1.2 Display 9
1.3 Socket field 10

2 Safety 11
2.1 Authorized use 12
2.2 General safety instructions 12

3 Commissioning 15
3.1 Scope of delivery 15
3.2 Initial commissioning 15

4 Operation 17
4.1 Switching on the meter 17
4.2 General operating principles 18
4.2.1 Operating modes 18
4.2.2 Operation 18
4.3 Measuring 19
4.3.1 Measuring the pH value 20
4.3.2 Measuring the ORP 21
4.4 Calibration 22
4.4.1 Calibration interval (*Int.C*) 27
4.4.2 (AutoCal) 28
4.4.3 Conventional calibration (ConCal) 30
4.5 Downloading calibration data 32
4.6 Settings 34
4.6.1 System settings 35
4.6.2 Measurement settings 37
4.7 Reset 41
4.7.1 Resetting calibration values 41
4.7.2 Resetting meter settings 42

5 Maintenance, cleaning, disposal 43
5.1 Maintenance 43
5.1.1 Replacing the batteries 43
5.2 Cleaning 44
5.3 Packing 44

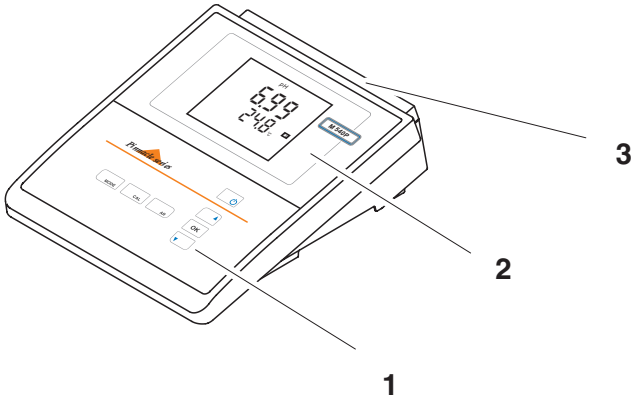
6 What to do if... 45

7 Technical data 49
7.1 General data 49
7.2 Measuring ranges, resolution, accuracy 51

8 Lists 53

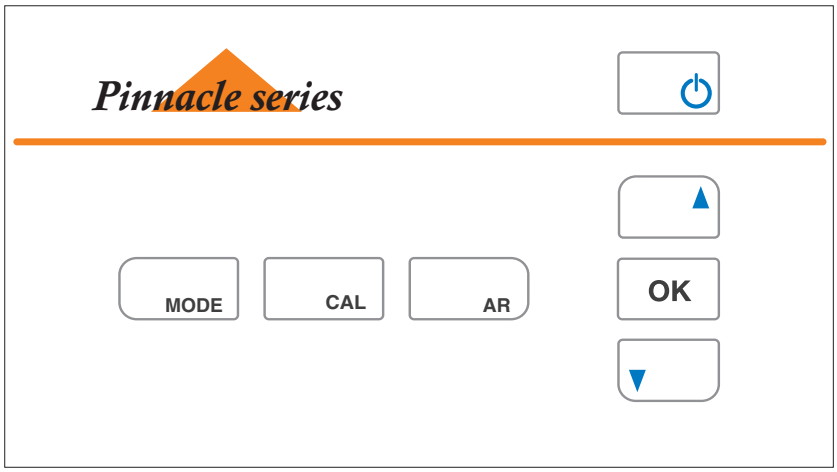
1 Overview

The compact M 530P precision pH meter enables you to perform pH measurements rapidly and reliably. The M 530P provides the maximum degree of operating comfort, reliability and measuring certainty for all applications.
The proven calibration procedures and special stability control function (AR) support your work with the pH meter.



1	Keypad
2	Display
3	Socket field

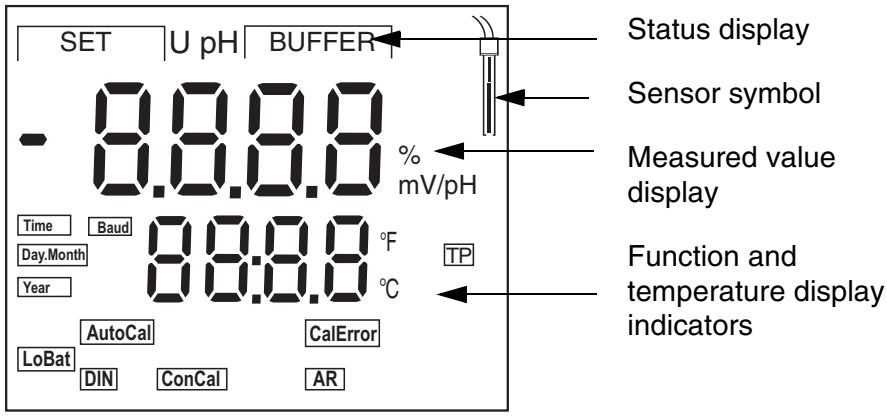
1.1 Keypad



In this operating manual, keys are indicated by brackets <..> .
The key symbol (e.g. **<OK>**) generally indicates a short keystroke (under 2 sec) in this operating manual. A long keystroke (approx. 2 sec) is indicated by the underscore behind the key symbol (e.g. **<OK__>**).

	<On/Off>: **<On/ Off__>:**	Switch the measuring instrument on/off Call up calibration data
	<MODE>: **<MODE__ >**:	Select measured parameter Open setting menu for calibration and measurement
	<CAL>: **<CAL__>**:	Call up calibration procedure Call up initialization
	<AR>: **<AR__>**:	Activate / deactivate stability control Set the interval for data transmission
	<▲>:	Increment values, scroll
	<▼>:	Decrement values, scroll
	<OK>: **<OK__>**:	Confirm entries Open setting menu for system settings

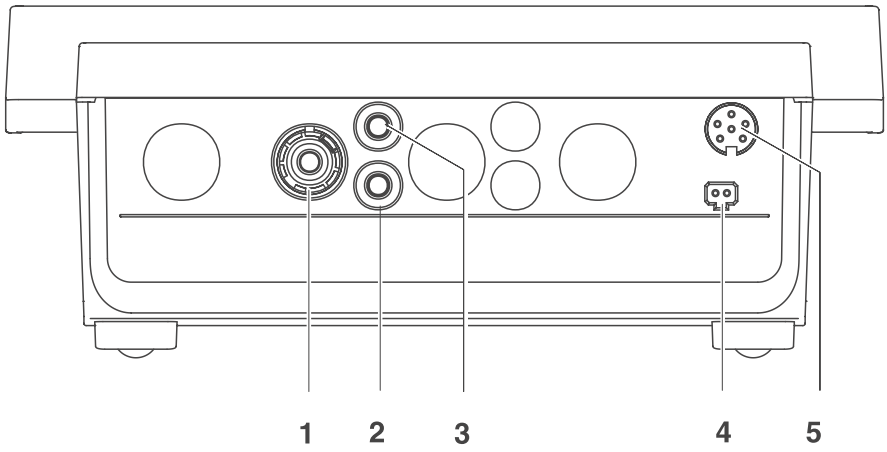
1.2 Display



Function display indicators

SET	During calibration: number of the buffer set
BUFFER	During calibration: number of the buffer
AutoCal	Calibration with automatic buffer recognition
CalError	An error occurred during calibration
LoBat	With battery operation: batteries almost empty
AR	Stability control is active
TP	Temperature measurement active

1.3 Socket field



Connectors:

1	pH electrode
2	Reference electrode
3	Temperature sensor
4	Power pack
5	Service interface

Caution
Only connect sensors to the meter that cannot return any voltages or currents that are not allowed (> SELV and > current circuit with current limiting).
Almost all customary sensors fulfill these conditions.

2 Safety

This operating manual contains basic instructions that you must follow during the commissioning, operation and maintenance of the meter. Consequently, all responsible personnel must read this operating manual before working with the meter.
The operating manual must always be available within the vicinity of the meter.

Target group

The meter was developed for work in the laboratory.
Thus, we assume that, as a result of their professional training and experience, the operators will know the necessary safety precautions to take when handling chemicals.

Safety instructions

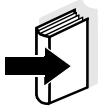
Safety instructions in this operating manual are indicated by the warning symbol (triangle) in the left column. The signal word (e.g. "Caution") indicates the level of danger:

Warning
indicates instructions that must be followed precisely in order to avoid possibly great dangers to personnel.

Caution
indicates instructions that must be followed precisely in order to avoid the possibility of slight injuries or damage to the meter or the environment.

Further notes

Note
indicates notes that draw your attention to special features.



Note
indicates cross-references to other documents, e.g. operating manuals.

2.1 Authorized use

This meter is authorized exclusively for pH and ORP measurements in the laboratory.
The technical specifications as given in chapter 7 TECHNICAL DATA must be observed. Only the operation and running of the meter according to the instructions given in this operating manual is authorized.
Any other use is considered **unauthorized**.

2.2 General safety instructions

This meter is constructed and tested in compliance with the IEC 1010 safety regulations for electronic measuring instruments.
It left the factory in a safe and secure technical condition.

Function and operational safety

The smooth functioning and operational safety of the meter can only be guaranteed if the generally applicable safety measures and the specific safety instructions in this operating manual are followed during operation.

The smooth functioning and operational safety of the meter can only be guaranteed under the environmental conditions that are specified in chapter 7 TECHNICAL DATA.

If the meter was transported from a cold environment to a warm environment, the formation of condensate can lead to the faulty functioning of the meter. In this event, wait until the temperature of the meter reaches room temperature before putting the meter back into operation.

Caution
The meter is only allowed to be opened by authorized personnel.

Safe operation

If safe operation is no longer possible, the meter must be taken out of service and secured against inadvertent operation!
Safe operation is no longer possible if the meter:

- has been damaged in transport
- has been stored under adverse conditions for a lengthy period of time
- is visibly damaged
- no longer operates as described in this manual.

If you are in any doubt, please contact the supplier of the meter.

Obligations of the purchaser

The purchaser of this meter must ensure that the following laws and guidelines are observed when using dangerous substances:

- EEC directives for protective labor legislation
- National protective labor legislation
- Safety regulations
- Safety datasheets of the chemical manufacturers.

3 Commissioning

3.1 Scope of delivery

- M 530P laboratory meter
- Power pack
- 4 batteries 1.5 V Mignon type AA
- Stand with stand base
- Operating manual

3.2 Initial commissioning

Perform the following activities:

- Switch on the meter
- Set the date and time
- Connect the power pack (for line power operation only).

Switching on the meter

1	Switch on the meter with **<On/Off>**. A display test is briefly displayed.

Setting the date and time

2	See section 4.6.1

Connecting the power pack

Caution
The line voltage at the operating site must lie within the input voltage range of the original power pack (see chapter 7 TECHNICAL DATA).

Caution
Use original power packs only (see chapter 7 TECHNICAL DATA).

3	Insert the plug into the socket of the pH meter.
4	Connect the original power pack to an easily accessible power outlet.

Note
You can carry out measurements without the power pack.

4 Operation

4.1 Switching on the meter

1	Place the meter on a flat surface and protect it from intense light and heat.
2	Press the **<On/Off>** key. A display test is briefly displayed. Subsequently, the meter switches to the measuring mode (measured value display).

Note
The meter has an energy saving feature to avoid unnecessary battery depletion during battery operation.
The energy saving feature switches off the meter if no key was pressed during the specified interval (setting the switch-off interval see section 4.6.1).
The energy saving feature is not active:

- if the power is supplied by the power pack

4.2 General operating principles

This section contains basic information on the operation of the M 530P.

4.2.1 Operating modes

The meter has the following operating modes:

- Measurement
  The display indicates the measurement data in the measured value display
- Calibration
  The display guides you thru a calibration procedure with calibration information
- Configuration
  The system menu or a sensor menu with submenus, settings and functions is displayed

4.2.2 Operation

Keys The meter is operated via keys. The keys can have different functions with long or short keystrokes.

Functions Generally, with a short keystroke a function is carried out. A long keystroke opens a setting menu.

In a setting menu, settings are selected with the **<▲><▼>** keys. A setting is confirmed with **<OK>**. With confirming, the setting is finished and the next setting is displayed.

Representation In this operating manual, keys are indicated by brackets <..> . The key symbol (e.g. **<OK>**) generally indicates a short keystroke (under 2 sec) in this operating manual. A long keystroke (approx. 2 sec) is indicated by the underscore behind the key symbol (e.g. **<OK__>**).

4.3 Measuring

Preparatory activities

Perform the following preparatory activities when you want to measure:

1	Connect an electrode to the meter.
2	Adjust the temperature of the buffer solutions or test solutions, or measure the current temperature, if you measure without a temperature sensor.
3	Calibrate or check the meter with the electrode.
4	Select the measured parameter with **<MODE>**.

Note
Incorrect calibration of pH electrodes leads to incorrect measured values. Calibrate regularly before measuring.

Temperature sensor

You can measure with or without a temperature sensor. If a temperature sensor is connected, it is indicated on the display by *TP*.

Note
The pH meter automatically recognizes the type of the temperature sensor used. Therefore, you can connect electrodes with an NTC30 or Pt1000.

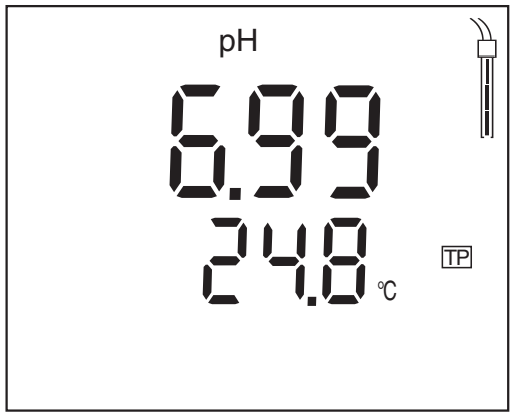
The temperature measurement is absolutely essential for a reproducible pH measurement. If the measurement is made without a temperature sensor, proceed as follows:

1	Measure the current temperature using a thermometer.
2	Set the temperature value with **<▲><▼>**.

Note
When calibrating without temperature sensor, also set the current temperature of each buffer solution manually with the **<▲><▼>** keys.

4.3.1 Measuring the pH value

1	Perform the preparatory activities according to section 4.3.
2	Immerse the pH electrode in the test sample.
3	Using **<MODE>**, scroll as necessary until the measured parameter *pH* is displayed.



Stability control *AR* (drift control)

The stability control function (drift control) checks the stability of the measurement signal. The stability has a considerable effect on the reproducibility of the measured value.

For identical measurement conditions, the following criteria apply:

Drift within 15 sec < 0.02 pH units.

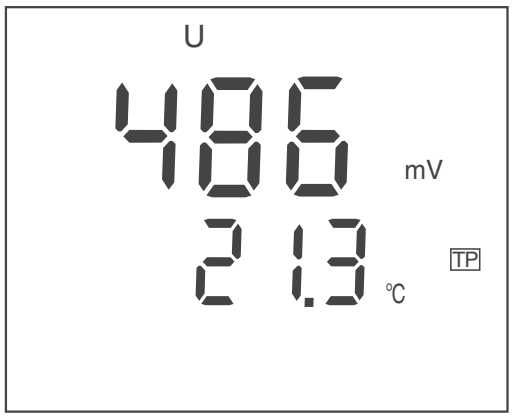
1	If necessary, call up the measured variable pH with **<MODE>**.
2	With **<AR>**, activate the stability control function. The *AR* function display indicator appears. The current measured value is frozen (hold function).
3	Start measurement with stability control with **<OK>**. The AR display indicator flashes until a stable value is measured.
4	If necessary, start the next measurement with stability control with **<OK>**.
5	To terminate the stability control function: press the **<MODE>** or **<AR>** key.

Note
The current measurement with stability control can be terminated at any time (accepting the current value) by pressing **<OK>**.

4.3.2 Measuring the ORP

The meter can, in conjunction with an ORP electrode, measure the ORP (mV) of a solution.

1	Perform the preparatory activities according to section 4.3.
2	Immerse the ORP electrode in the test sample.
3	If necessary, call up the measured parameter U with **<MODE>**.
4	Wait for a stable measured value.



Note
ORP electrodes are not calibrated. However, you can check ORP electrodes using a test solution.

4.4 Calibration

Why calibrate?

pH electrodes age. This changes the zero point (asymmetry) and slope of the pH electrode. As a result, an inexact measured value is displayed. Calibration determines the current values of the zero point and slope of the electrode and stores them in the meter. Thus, you should calibrate at regular intervals.

When do you have to calibrate?

- After connecting another electrode
- When the sensor symbol flashes on the display:
  - after the calibration interval has expired
  - after a voltage interruption (empty batteries)

AutoCal

is adapted to the permanently programmed buffer solutions as a fully automatic single-point or two-point calibration. The buffer solutions are automatically recognized by the meter.

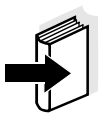
Buffer sets for calibration

You can use the buffer sets quoted in the table for an automatic calibration. The pH values are valid for the specified temperature values. The temperature dependence of the pH values is taken into consideration during the calibration.

No.	Buffer set *	pH values	at
1	Buffers according to DIN 19266 and NIST Retraceable Buffers	1.679 4.006 6.865 9.180 12.454	25 °C
2	Technical buffers	2.000 4.010 7.000 10.011	25 °C
3	Merck1*	4.000 7.000 9.000	20°C
4	Merck2 *	1.000 6.000 8.000 13.000	20°C
5	Merck3 *	4.660 6.880 9.220	20°C

No.	Buffer set *	pH values	at
6	DIN 19267 1	1.090 4.650 6.790 9.230	25 °C
7	Mettler Toledo USA *	1.679 4.003 7.002 10.013	25 °C
8	Mettler Toledo TEC *	1.995 4.005 7.002 9.208	25 °C
9	Fisher *	2.007 4.002 7.004 10.002	25 °C
10	Fluka BS *	4.006 6.984 8.957	25 °C
11	Radiometer *	1.678 4.005 7.000 9.180	25 °C
12	Baker *	4.006 6.991 10.008	25 °C
13	Metrohm *	3.996 7.003 8.999	25 °C
14	Beckman *	4.005 7.005 10.013	25 °C
15	Hamilton Duracal *	4.005 7.002 10.013	25 °C
16	Precisa *	3.996 7.003 8.999	25 °C

* Brand names or trade names are trademarks of their respective owners protected by law (see page 57).



Note
The buffer set is selected in the menu for measurement settings (see section 4.6.2).

Calibration points

Calibration can be performed using one or two buffer solutions in any order (single-point or two-point calibration). The meter determines the following values and calculates the calibration line as follows:

	Determined values	Displayed calibration data
1-point	ASY	● Zero point = *ASY* ● Slope = Nernst slope (-59.16 mV/pH at 25 °C)
2-point	ASY SLO	● Zero point = *ASY* ● Slope = *SLO*

Note
You can display the slope in the units, mV/pH or %.
You can display the zero point in the units, mV or pH.

ConCal

This function is a conventional two-point calibration using two buffer solutions (pH 7.0 ± 0.5 and any other buffer solution) or a single-point calibration using any buffer solution and is used as a high-speed method.

Stability control

The calibration procedure automatically activates the stability control function.
The current measurement with stability control can be terminated at any time (accepting the current value) by pressing **<OK>**.

Calibration record

When finishing a calibration, the new calibration values are first displayed as an informative message and stored.

Displaying the calibration data

You can display the data of the last calibration (see section 4.5).

Calibration evaluation

After calibrating, the meter automatically evaluates the calibration. The zero point and slope are evaluated separately. The worse evaluation of both is taken into account. The evaluation appears on the display as the sensor symbol and in the calibration record.

Sensor symbol	Calibration record	Zero point [mV]	Slope [mV/pH]
	+++	-15 ... +15	-60.5 ... -58
	++	-20 ... +20	-58 ... -57
	+	-25 ... +25	-61 ... -60.5 or -57 ... -56
 Clean the electrode according to the sensor operating manual	-	-30 ... +30	-62 ... -61 or -56 ... -50
CalError Eliminate the error according to chapter 6 WHAT TO DO IF...	*CalError*	< -30 or > 30	... -62 or ... -50

Preparatory activities

1	Switch on the meter with **<On/Off>**.
2	Connect a pH electrode to the meter.
3	Keep the buffer solutions ready.

4	Adjust the temperature of the solutions and measure the current temperature if the measurement is made without temperature sensor.
5	Set the buffer set to be used for calibration as necessary.

4.4.1 Calibration interval (*Int.C*)

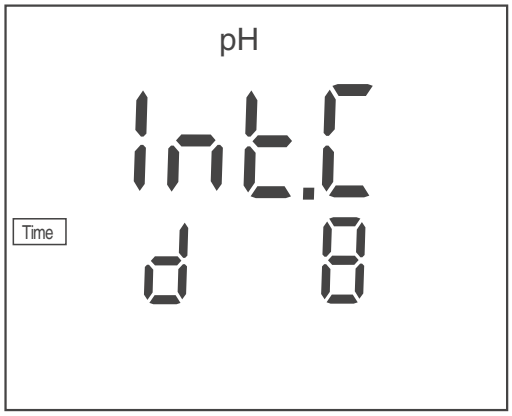
The calibration interval reminds you to calibrate regularly. When the adjusted calibration interval (*Int.C*) has expired, the sensor symbol flashes. It is still possible to measure.

Note
To ensure the high measuring accuracy of the measuring system, calibrate after the calibration interval has expired.

Setting the calibration interval

The calibration interval (*Int.C*) is set to 7 days (*d7*) in the factory. You can change the interval (1 ... 999 days):

1	Open the menu for measurement settings with **<MODE__>**.
2	Confirm all settings with **<OK>** until *Int.C* is displayed.



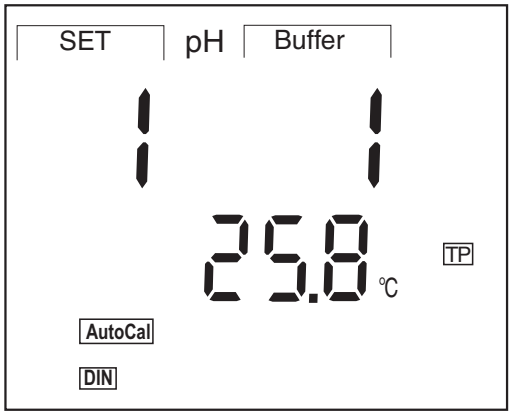
3	Set the calibration interval with **<▲><▼>**.
4	Confirm the setting with **<OK>**.

4.4.2 (AutoCal)

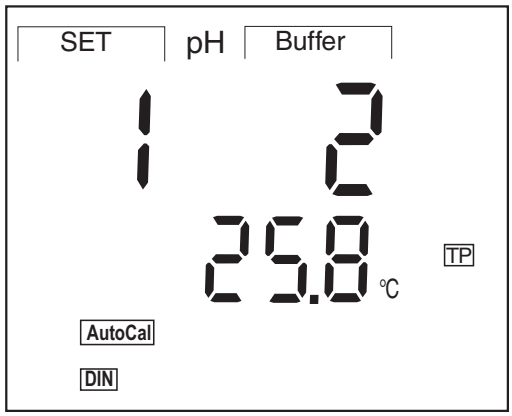
For this procedure, use two buffer solutions of the selected buffer set in any order.

Note
The steps 2 and 6 are not necessary if you use a temperature sensor.

1	Start the calibration with **<CAL>**. The number of the specified buffer set is displayed (SET 1 ... 16). The first buffer (BUFFER 1) of the buffer set (SET_x) is requested.



2	If necessary, set the temperature of the buffer solution with **<▲><▼>**.
3	Immerse the pH electrode in the first buffer solution.
4	Start the measurement with **<OK>**. The *AR* display indicator flashes. Depending on the setting, the display shows the nominal pH value for the recognized buffer or the electrode voltage (mV). As soon as a stable value is recognized, the next buffer (BUFFER 2) is requested.



Note
Here you can cancel the calibration procedure with **<MODE>**. This corresponds to a **single-point calibration**. The value of the zero point (ASY) is displayed for 10 seconds, then the value of the slope (SLO) is displayed for 10 seconds. After this the meter switches to the measuring mode.

Continuing with two-point calibration

5	Thoroughly rinse the electrode with distilled water.
6	If necessary, set the temperature of the second buffer solution with **<▲><▼>**.
7	Immerse the electrode in the second buffer solution.
8	Press the **<OK>** key. The *AR* display indicator flashes. Depending on the setting, the display shows the nominal pH value for the recognized buffer or the electrode voltage (mV). As soon as a stable value is recognized, the value of the zero point (ASY) is displayed for 10 seconds, then the value of the slope (SLO) is displayed for 10 seconds. After this the meter switches to the measuring mode.

Note
While the zero point (*ASY*) is being displayed, you can change the unit of the zero point with **<▲><▼>**.

While the slope (*SLO*) is being displayed, you can change the unit of the slope with **<▲><▼>**.
The % display refers to the Nernst slope of 59.2 mV/pH at 25° C (100 x determined slope/Nernst slope).

The unit of zero point and slope can also be changed permanently in the measurement settings (see section 4.6.2).

4.4.3 Conventional calibration (ConCal)

Single-point calibration

Use any buffer solution for this rapid method.
The calibration will be the more exact the nearer the pH value of the buffer solution is to that of the test sample.

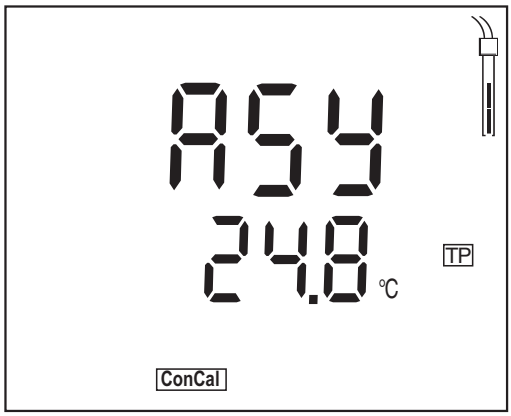
Two-point calibration

Use two buffer solutions for this procedure:

- pH 7.0 ± 0.5
- any other buffer solution

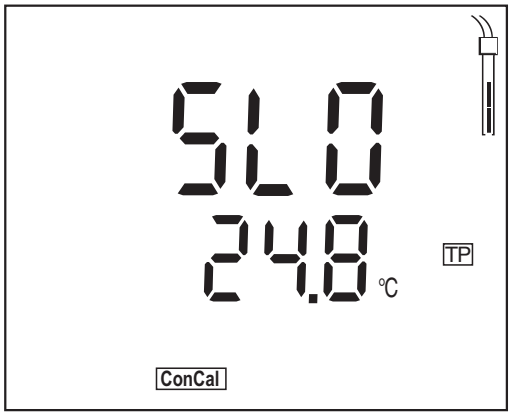
Note
The steps 2 and 9 are not necessary if you use a pH electrode with a temperature sensor.

1	Press the **<CAL>** key repeatedly until the *ASY* display indicator and the *ConCal* function indicator appear. The sensor symbol displays the evaluation of the last calibration (or no sensor symbol in the delivery state or after the measurement parameters have been reset).



2	If necessary, set the temperature of the first buffer solution with **<▲><▼>**.
3	Immerse the pH electrode in the first buffer solution (pH 7.0 ± 0.5 for two-point calibration).
4	Press the **<OK>** key. The measured pH value appears on the display.
5	Using **<▲><▼>**, set the measured value to the nominal pH value of the buffer solution (at the current temperature).
6	Press the **<OK>** key. The value of the zero point (mV) and the sensor symbol appear on the display.
7	Press the **<OK>** key. *SLO* appears on the display.

Note
Here you can cancel the calibration procedure with **<MODE>**. This corresponds to a **single-point calibration**. The value of the zero point (ASY) is displayed for 10 seconds, then the value of the slope (SLO) is displayed for 10 seconds. After this the meter switches to the measuring mode.



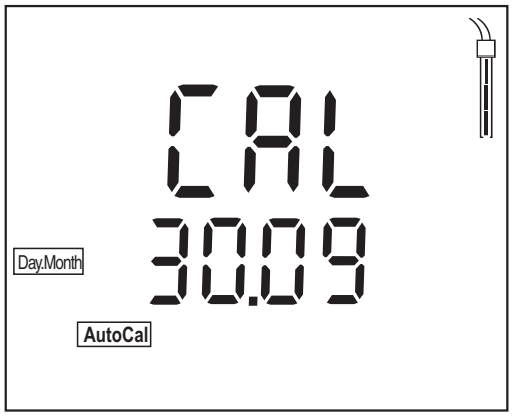
8	To continue the two-point calibration, thoroughly rinse the electrode with deionized water.
9	If necessary, set the temperature of the second buffer solution with <▲><▼>.
10	Immerse the pH electrode in the second buffer solution.
11	Press the **<OK>** key. The second pH value appears on the display.
12	Using <▲><▼>, set the measured value to the nominal pH value of the buffer solution (at the current temperature).
13	When the measured value is stable, press the **<OK>** key. The value of the zero point (ASY) is displayed for 10 seconds, then the value of the slope (SLO) is displayed for 10 seconds. After this the meter switches to the measuring mode.

4.5 Downloading calibration data

Download to display (during display test)

You can download calibration data to the display as follows:

1	Switch on the meter with **<On/Off>**. The display test appears briefly on the display.
2	During the display test, display the calibration data with **<CAL>**. The following data is displayed consecutively for 10 seconds each: date, zero point, slope.



While the calibration data is being displayed you can:

- press **<OK>** to display further calibration data (date, zero point, slope)
- press **<▲><▼>** to switch over the unit of the zero point (*ASY*) (while the zero point is being displayed)
- press **<▲><▼>** to switch over the unit of the slope (*SLO*) (while the slope is being displayed)

Download to display via calibration menu

1	Press **<CAL>**.
2	Press **<CAL__>** to display the calibration data. The following data is displayed consecutively for 10 seconds each: date, asymmetry, slope.

While the calibration data is being displayed you can:

- press **<OK>** to display further calibration data (date, zero point, slope)

- press <▲><▼> to switch over the unit of the zero point (*ASY*) (while the zero point is being displayed)
- press <▲><▼> to switch over the unit of the slope (*SLO*) (while the slope is being displayed)

4.6 Settings

You can adapt the meter to your individual requirements. The settings are done in the following menus:

- System settings (**<OK__>**)
  - Switch-off interval (*t.Off*)
  - Date (*Day.Month*)
  - Date (Year)
  - Time (*Time*)
- Calibration and measurement settings (**<MODE__>**)
  - Number of the buffer set for pH calibration (*Set 1 ... 16*)
  - Display of the buffer during calibration (pH nominal value or measured voltage value in mV)
  - Unit of the value for the slope (*mV/pH* or *%*)
  - Unit of the value for the zero point (*mV*, *pH*)
  - Temperature unit (*°C* / *°F*)
  - Calibration interval (*Int.C* [0 ... 999])

Note
You can exit the setting menu at any time by pressing **<MODE>**. Settings already modified and confirmed with **<OK>** are stored.

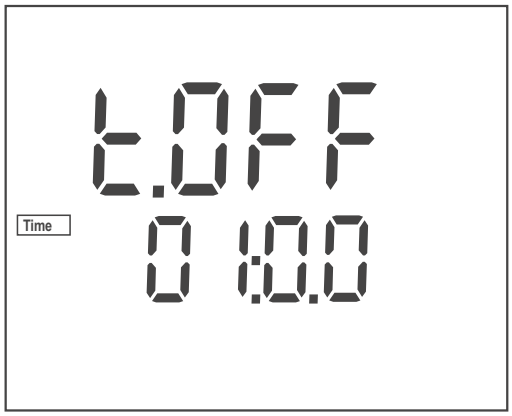
4.6.1 System settings

The default setting is printed in bold.

Switch-off interval (*t.Off*)	10, 20, 30, 40, 50 min, 1, 2, 3, 4, 5, 10, 15, 20, 24 h
Date (*Day.Month*)	Any
Date (Year)	Any
Time (*Time*)	Any

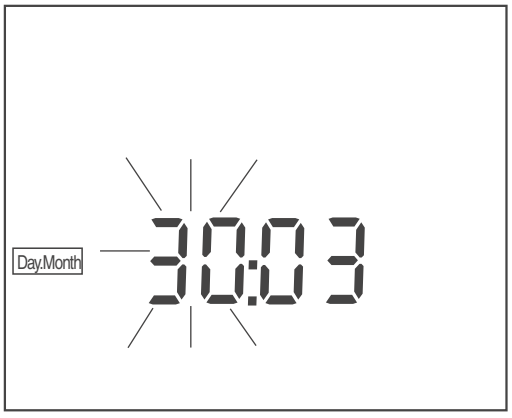
1	Open the menu for system settings with **<OK__>**. The first system setting is displayed.

Switch-off interval (*t.Off*)



2	Set the switch-off interval with **<▲><▼>**.
3	Confirm with **<OK>**. *Day.Month*, the setting of the date is displayed. The day display flashes.

Date and time



4	Set the date of the current day with **<▲><▼>** .
5	Confirm with **<OK>**. The month display flashes.
6	Set the current month with **<▲><▼>** .
7	Confirm with **<OK>**. *Ident*, the setting of the year is displayed.
8	Set the year with **<▲><▼>** .
9	Confirm with **<OK>**. The setting of the time is displayed. The hour display flashes.
10	Set the current hour with **<▲><▼>** .
11	Confirm with **<OK>**. The minute display flashes.
12	Set the current minute with **<▲><▼>** .
13	Confirm with **<OK>**. The system settings are completed. The meter switches to the measuring mode.

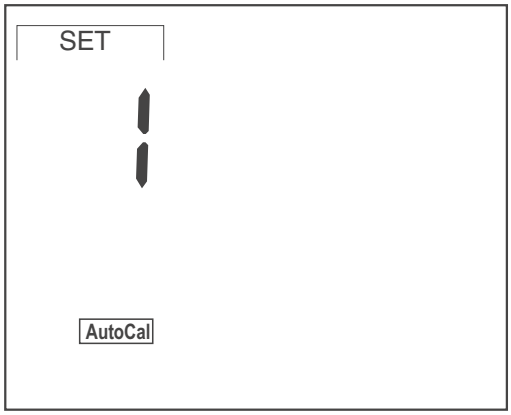
4.6.2 Measurement settings

These settings apply to calibration and measurement (the default setting is printed in bold).

Number of the buffer set for pH calibration (*SET*)	***1** ... 16*
Display during calibration (*BUFFER*)	***pH*** (buffer nominal value), *U* (electrode voltage)
Unit of the value for the slope (*SLO*)	***mV/pH***, *%*
Unit of the value for the zero point (*ASY*)	***mV**, pH*
Temperature unit (*UnIt*)	°**C**, °F
Calibration interval (*Int.C*)	*0 ... **7** ... 999 d*

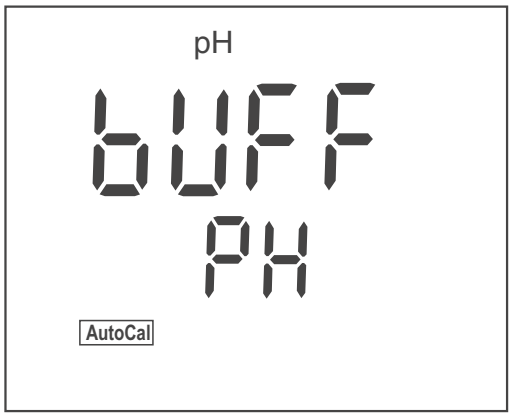
Buffer set for pH calibration (*SET*)

1	Open the menu for measurement settings with **<MODE__>**. *Set 1 ... 16,* the specified buffer set is displayed.



2	Using **<▲><▼>**, select a buffer set, *Set 1 ... 16*.
3	Confirm with **<OK>**. *bUFF,* the setting of the display during calibration is displayed.

Display during calibration (*bUFF*)

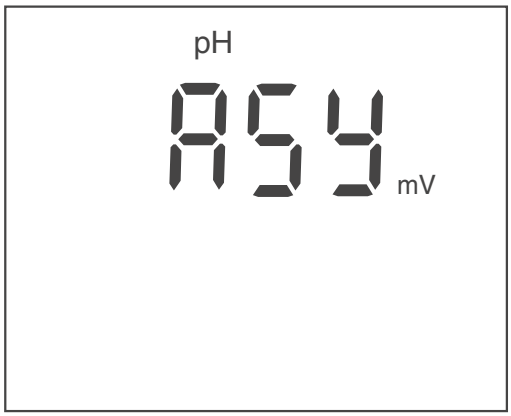


4	Using <▲><▼>, select the *pH* or *U* display during calibration.
5	Confirm with **<OK>**. *SLO*, the unit of the value for the slope (*mV/pH* or *%*) is displayed.

Unit of the value for the slope (*SLO*)

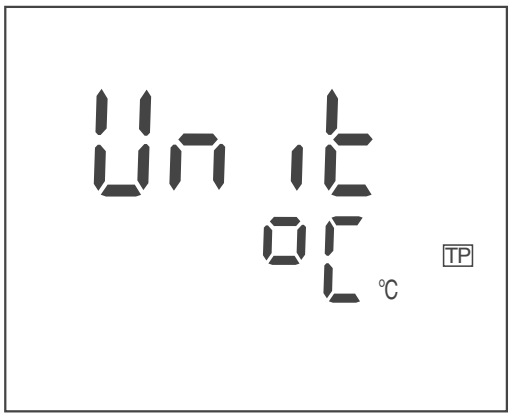
6	Using <▲><▼>, select the unit for the slope.
7	Confirm with **<OK>**. *ASY*, the unit of the value for the zero point (*mV* or *pH*) is displayed.

Unit of the value for the zero point (*ASY*)



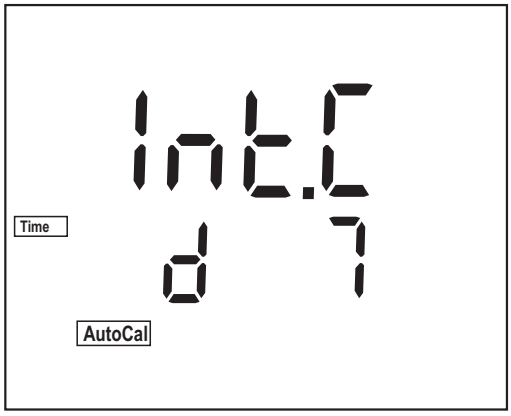
8	Using <▲><▼>, select the unit for the zero point.
9	Confirm with **<OK>**. *Unit*, the setting of the unit of the temperature value is displayed.

Temperature unit (*Unit*)



10	Using <▲><▼>, toggle between *°C* and *°F*.
11	Confirm with **<OK>**. *Int.C*, the setting of the calibration interval is displayed.

Calibration interval (*Int.C*)



12	Set the interval with <▲><▼>.
13	Confirm with **<OK>**. The measurement settings are completed. The meter switches to the measuring mode.

4.7 Reset

4.7.1 Resetting calibration values

This function resets the calibration values to the default condition. All other meter settings are retained.

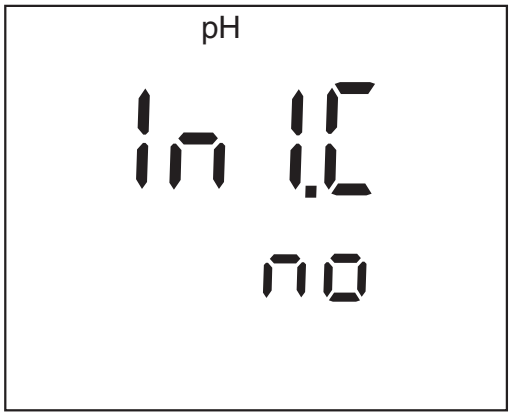
Calibration values in the default condition

Zero point	pH 7.000 (0 mV)
Slope	100 % (-59.16 mV/pH)

Note
The measuring system is not calibrated after a reset. Before measuring, recalibrate the meter.

Resetting calibration values

1	Press **<On/Off__>** to open the menu for the reset of the calibration data. *Ini.C* is displayed.



2	Press **<▲><▼>** to display *no* or *YES*. *YES*: Reset the calibration values. *no*: Retain the calibration values.
3	Confirm with **<OK>**. The menu is finished. The meter switches to the measuring mode.

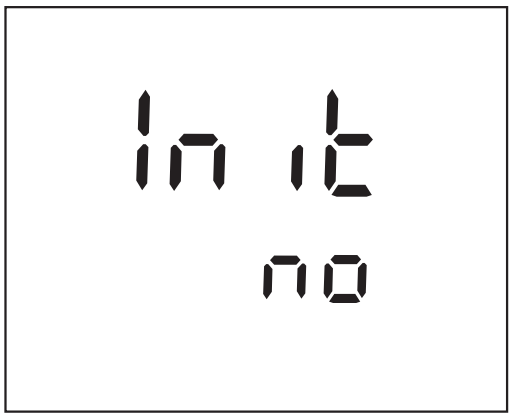
4.7.2 Resetting meter settings

This function resets to the default condition all meter settings. The relevant values are given in the following sections:

System settings	section 4.6.1
Measurement settings	section 4.6.2

Resetting the meter settings

1	Switch on the meter with **<On/Off>**. The display test appears briefly on the display.
2	During the display test, press **<MODE>** to open the menu for the reset of the meter settings. *Init* is displayed.



3	Press <▲><▼> to display *no* or *YES*. *YES*: Reset the meter settings. *no*: Retain the meter settings.
4	Confirm with **<OK>**. The menu is finished. The meter switches to the measuring mode.

Note
The measuring system is not calibrated after a reset. Before measuring, recalibrate the meter.

5 Maintenance, cleaning, disposal

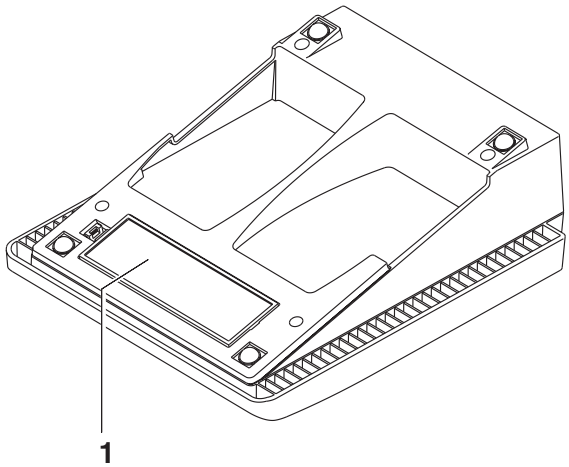
5.1 Maintenance

The only maintenance activity required is replacing the batteries.

Note
For maintenance of the electrodes refer to the relevant operating manuals.

5.1.1 Replacing the batteries

1	Open the battery compartment (1) on the underside of the meter.
2	Remove the four batteries from the battery compartment.
3	Place four new batteries (type Mignon AA) in the battery compartment.
4	Close the battery compartment (1). The date (day) flashes on the display.
5	Set the date and time according to section 4.6.1.



Caution
Make sure that the poles of the batteries are the right way round. The ± signs on the batteries must correspond to the ± signs in the battery compartment.
Only use leakproof alkaline manganese batteries.

5.2 Cleaning

Occasionally wipe the outside of the meter with a damp, lint-free cloth. Disinfect the housing with isopropanol as required.

Caution
The housing is made of synthetic material (ABS). Thus, avoid contact with acetone or similar detergents that contain solvents. Remove any splashes immediately.

5.3 Packing

This meter is sent out in a protective transport packing.
We recommend: Keep the packing material. The original packing protects the meter against damage during transport.

6 What to do if...

Error message
Err1

Cause	Remedy
pH electrode:	
– Measured value outside the measuring range	– Use a suitable electrode
– Air bubble in front of the diaphragm	– Remove air bubble
– Air in the diaphragm	– Extract air or moisten diaphragm
– Cable broken	– Replace electrode
– Gel electrolyte dried out	– Replace electrode

Error message
Err2

Cause	Remedy
– No electrode connected	– Connect electrode
– Setting time during calibration too long	– Adjust temperature if necessary – Recalibrate

Error message
Err4

Cause	Remedy
– Temperature not stable during calibration.	– Adjust temperature if necessary – Recalibrate

Error message
CalError

Cause	Remedy
pH electrode:	
– The values determined for zero point and slope of the electrode are outside the allowed limits.	– Recalibrate
– Diaphragm contaminated	– Clean diaphragm
– Electrode broken	– Replace electrode

Cause	Remedy
Buffer solutions	
– Incorrect buffer solutions	– Change calibration procedure
– Buffer solutions too old	– Use only once. Note the shelf life
– Buffer solutions depleted	– Change solutions

No stable measured value

Cause	Remedy
pH electrode:	
– Diaphragm contaminated	– Clean diaphragm
– Membrane contaminated	– Clean membrane

Test sample:	
– pH value not stable	– Measure with air excluded if necessary
– Temperature not stable	– Adjust temperature if necessary

Electrode + test sample:	
– Conductivity too low	– Use a suitable electrode
– Temperature too high	– Use a suitable electrode
– Organic liquids	– Use a suitable electrode

Sensor symbol flashes

Cause	Remedy
– Calibration interval expired	– Recalibrate the measuring system

Display, *LoBat*

Cause	Remedy
– Batteries almost empty	– Replace the batteries (see section 5.1 MAINTENANCE)

Obviously incorrect measured values

Cause	Remedy
pH electrode:	
– pH electrode unsuitable	– Use a suitable electrode
– Temperature difference between buffer and test sample too high	– Adjust temperature of buffer or sample solutions
– Measurement procedure not suitable	– Follow special procedure

Meter does not react to keystroke

Cause	Remedy
– Operating condition undefined or EMC load unallowed	– Processor reset: Press and hold the **<AR>** key and switch the meter on

You want to know which software version is in the instrument

Cause	Remedy
– E. g., a question by the service department	– Switch on the meter. During the display test, display the software version with **<OK>**.

7 Technical data

7.1 General data

Dimensions	approx. 240 x 190 x 80 mm	
Weight	approx. 1.0 kg (without power pack, without stand)	
Mechanical structure	Type of protection	IP 43
Electrical safety	Protective class	III
Test certificates	cETLus	

Ambient conditions	Storage	- 25 °C ... + 65 °C
	Operation	0 °C ... + 55 °C
	Climatic class	2

Power supply	Batteries	4 x 1.5 V alkali-manganese batteries, Type AA
	Operational life	Approx. 1000 operating hours
	Power pack (charging device)	FRIWO FW7555M/09, 15.1432.500-00 Friwo Part. No. 1883259 Input: 100 ... 240 V ~ / 50 ... 60 Hz / 400 mA Output: 9 V = / 1.5 A Connection max. overvoltage category II Primary plugs contained in the scope of delivery: Euro, US, UK and Australian.

Guidelines and norms used	EMC	EC guideline 89/336/EEC EN 61326 EN 61000-3-2 EN 61000-3-3 FCC Class A
	Meter safety	EEC guideline 73/23/EEC EN 61010-1 ANSI/UL 61010-1; Issued 2004/07/12 Ed: 2, Rev.: 2005/07/22 CAN/CSA-C22.2 No. 61010-1
	Climatic class	VDI/VDE 3540
	IP protection	EN 60529

FCC Class A Equipment Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

7.2 Measuring ranges, resolution, accuracy

Measuring ranges, resolution

Variable	Measuring range	Resolution
pH	- 2.00 ... + 19.99	0.01
U [mV]	- 2000 ... + 2000	1
T [°C]	- 5.0 ... + 105.0	0.1
T [°F]	23.0 ... + 221.0	0.1

Manual temperature input

Variable	Range	Increment
T_{manual} [°C]	- 5 ... + 125	1
T_{manual} [°F]	23 ... + 257	1

Accuracy (± 1 digit)

Variable	Accuracy	Test sample temperature
pH / range *		
- 2.00 ... + 19.99	± 0.01	+ 15 °C ... + 35 °C
U [mV] */ range*		
- 2000 ... + 2000	± 1	+ 15 °C ... + 35 °C
T [°C] */ temperature sensor*		
NTC 30	± 0.1	
PT 1000	± 0.3	

** when measuring in a range of ± 2 pH around a calibration point*

Note
The accuracy values specified here apply exclusively to the meter. The accuracy of the electrodes and buffer solutions has to be taken into account additionally.

8 Lists

This chapter provides additional information and orientation aids.

Abbreviations The list of abbreviations explains abbreviations that appear on the display or when dealing with the meter.

Specialist terms The glossary briefly explains the meaning of the specialist terms. However, terms that should already be familiar to the target group are not described here.

Trademarks used The list comprises the trademarks used in the present document and their owners.

Index The index helps you to find the topics that you are looking for.

Abbreviations

°C	Temperature unit °Celsius
°F	Temperature unit, °Fahrenheit
AR	Stability control (drift control)
ASY	Zero point (asymmetry)
AutoCal	Automatic calibration using a selected buffer set
Cal	Calibration
CalError	Error message (see WHAT TO DO IF...)
disp	Display Data memory is displayed
Err1	Overflow Display range exceeded
Err2	Overflow Display range exceeded
Err4	Display range exceeded
InI	Initialization Resets individual basic functions to the status they had on delivery
LoBat	Low Battery (batteries almost empty)
mV	Voltage unit
mV/pH	Unit of the electrode slope
pH	pH value
S	Slope value
SELV	Safety Extra Low Voltage
SLO	Slope (slope on calibration)
TP	Temperature Probe Temperature measurement active

Glossary

Adjusting — To manipulate a measuring system so that the relevant value (e. g. the displayed value) differs as little as possible from the correct value or a value that is regarded as correct, or that the difference remains within the tolerance.

Asymmetry — see zero point

AutoRange — Name of the automatic selection of the measuring range.

Calibration — Comparing the value from a measuring system (e. g. the displayed value) to the correct value or a value that is regarded as correct. Often, this expression is also used when the measuring system is adjusted at the same time (see adjusting).

Electromotive force of an electrode — The electromotive force (voltage) U of the electrode is the measurable electromotive force of an electrode in a solution. It equals the sum of all the galvanic voltages of the electrode. Its dependency on the pH results in the electrode function, which is characterized by the parameters, slope and zero point.

Junction — The junction is a porous body in the housing wall of reference electrodes or electrolyte bridges. It arranges the electrical contact between two solutions and makes the electrolyte exchange more difficult. The expression, junction, is also used for ground or junction-less transitions.

Measured value — The measured value is the special value of a measured parameter to be determined. It is given as a combination of the numerical value and unit (e. g. 3 m; 0.5 s; 5.2 A; 373.15 K).

Measured variable — The measured parameter is the physical dimension determined by measuring, e. g. pH, conductivity or D.O. concentration.

Molality — Molality is the quantity (in Mol) of a dissolved substance in 1000 g solvent.

ORP voltage — The ORP is caused by oxidizing or reducing substances dissolved in water, if these substances become effective at an electrode surface (e. g. a gold or platinum surface).

pH value — The pH is a measure of the acidic or basic effect of an aqueous solution. It corresponds to the negative decadic logarithm of the molal hydrogen ions activity divided by the unit of the molality. The practical pH value is the value of a pH measurement.

Potentiometry — Name of a measuring technique. The signal (depending on the measured parameter) of the electrode is the electrical potential. The electrical current remains constant.

Reset — Restoring the original condition of all settings of a measuring system.

Resolution	Smallest difference between two measured values that can be displayed by a measuring instrument.
Slope	The slope of a linear calibration function.
Stability control	Function to control the measured value stability.
Standard solution	The standard solution is a solution where the measured value is known by definition. It is used to calibrate a measuring system.
Test sample	Designation of the test sample ready to be measured. Normally, a test sample is made by processing the original sample. The test sample and original sample are identical if the test sample was not processed.
Zero point	The zero point of a pH electrode is the pH value at which the electromotive force of the pH electrode at a specified temperature is zero. Normally, this is at 25 °C.

Trademarks used

Trademark	Owner of the trademark
Merck	Merck KGaA
Mettler Toledo	Mettler Toledo
Fisher	Fisher Scientific Company
Fluka	Fluka AG
Radiometer	Radiometer
Baker	Mallinckrodt Baker, Inc.
Metrohm	Metrohm AG
Beckman	Beckman Instruments, Inc.
Hamilton	Hamilton Company Corporation
Precisa	Precisa Instruments AG
Windows	Microsoft Corporation

Index

A
Authorized use 12
AutoCal 28
AutoRead 20

B
Battery compartment 43

C
Calibration 22
Calibration evaluation
    pH 25
Calibration interval 27
Calibration points
    pH 24
ConCal 24, 30
Connect the power pack 15

D
Display 9
Drift control 20

E
Energy saving feature 17

F
Firmware update 61

I
Initial commissioning 15
Interval
    Calibration 27

K
Keys 8

L
LoBat 46

M
Measurement accuracy 27

O
Operation location 17
Operational safety 12
ORP electrode 21
ORP voltage 21

P
pH buffer sets 22
Precautions 11

R
Reset 41
    All meter settings 42
    Calibration values 41
Resolution setting 37, 38, 39

S
Safety 11
Scope of delivery 15
Setting the date 15, 35
Setting the time 15, 35
Single-point calibration 24, 29, 31
Slope
    pH 22
Socket field 10

T
Temperature sensor 19
Two-point calibration 24
    ConCal 30

Z
Zero point of the pH electrode 22

Appendix: Firmware update

General information

With theUpdate_Labxxx_MxxxP program and a PC you can update the firmware of the M 530P to the newest version.

For the update, you can connect the meter to a PC via the Service interface.

For the update via the Service interface, the following is required:

- a free RS232 interface on your PC
- an RS232 cable (interface cable).

Program installation

Install the firmware update program on your PC with the "Install_Update_Labxxx_MxxxP_Vx_yy_English.exe" installation program.

Program start

Start the "Update_Labxxx_MxxxP" program from the Windows start menu. The selected interface is displayed on the left side of the status bar at the lower edge of the window.

You can change the language via the language menu.

Firmware update

Proceed as follows:

1	Using the interface cable, connect the M 530P to the serial interface (COM port) of the PC.
2	Make sure the M 530P is switched on.
3	To start the update process click the OK button. The program automatically recognizes the used interface.
4	To go on, follow the instruction of the program. During the programming process, a corresponding message and a progress bar (in %) appear. The programming process takes approx. two minutes. A terminatory message is displayed after a successful programming process. The firmware update is now completed.
5	Disconnect the meter from the PC. The meter is ready for operation.

After switching the meter off and on you can check whether the meter has taken over the new software version (see page 47).

Nova Analytics Corp.
Woburn, MA USA 01801
866 664 6682

www.nova-ph.com